PRODROMITES, A NEW AMMONITE GENUS FROM THE LOWER CARBONIFEROUS

CONTENTS

Occurrence of Paleozoic Ammonites.—Until twenty-five years ago it was thought that the ammonites were confined entirely to the Mesozoic, and that the Paleozoic representatives of the Ammonitoid group were all goniatites. This was in keeping with the theory that ammonites all belonged to a single stock or phylum. But the discovery in the Salt Range Permian of several genera of different stocks that could not, by any stretching of the name, be called goniatites, upset this idea. For a long time after this the Permian ammonite fauna of India was looked upon as exceptional until the recognition of the Permian age of the ammonite fauna of the Artinsk beds of Russia. This was followed shortly by the discovery of similar forms in strata of the same age in Sicily and in Texas. It was then universally recognized that these forms were not exceptional, and might be looked for wherever the uppermost Paleozoic was found in its marine facies. But even as late as 1891 we find the Permian ammonite species of Texas described as Mesozoic types occurring in Paleozoic beds, and in all text-books even today the Permian epoch is given as the period of transition from goniatites into ammonites.

Steinmann and von Sutner[1] were the first to attempt to divide the ammonites into various phyla, derived from separate stocks of goniatites, and while their classification is not always in agreement with the most rational arrangement, it is very suggestive,

[1] STEINMANN: Elemente der Palaeontologie, 1890.

and has caused much fruitful discussion. The main points for which they contended have been accepted, and now it is generally admitted that ammonite genera may be much more closely related to goniatites than they are to contemporaneous or even antecedent ammonites. Karpinsky's[1] masterly researches in the phylogeny of the Prolecanitidæ contributed largely to this result, and prepared the way for Haug's[2] exhaustive study of the relations of the various phyla of goniatites.

When it is once admitted that there are several distinct stocks of different degrees of specialization and developing in different directions, there is no longer any sound reason for the commonly accepted opinion that they all made the transition at the same time; indeed, it is extremely illogical to expect that this would be the case. In spite of this, it will cause surprise, especially among those that cling to time-honored criteria, when it is announced that not only are characteristic ammonites found below the Permian, but even at the very base of the Carboniferous system, and in such an advanced stage of development that the transition from goniatite to ammonite must have taken place already in the Devonian. The occurrence of these forms is authentic, and not sporadic, for they were found in the same horizon, and in the same faunal association in three widely separated localities in America. It may be that they were prematurely specialized forms, like *Clymenia*, that developed suddenly from the main, unspecialized stock, and as suddenly became extinguished; but the existence of similar and evidently closely related forms in the Trias presupposes continuance of the stock. In reality, our knowledge of the various families of Paleozoic animals is as yet only fragmentary, and lack of record is no very strong argument against the occurrence of any group. We must remember that the greater part of the Paleozoic deposits are not now open to our inspection, and that whole faunal provinces and

[1] Die Ammoneen der Artinsk-Stufe. Mém. Acad. Impér. Sci. St. Petersburg, seventh series, Tome XXXVII, No. 2, 1889.

[2] Études sur les Goniatites. Mém Soc. Géol. France, Paléontol., Tome VII, No. 18, 1898.

regions are now obliterated, either washed away entirely, or covered by the sea, or concealed by later deposits. The first records in the rocks or in text-books do not, by any means, agree with the first appearance of any group in geologic history. This is clearly seen when one notes the constant pushing back of the records of the first appearance of types, that has taken place in the past ten years. Our ideas of the specialization of organic life in Cambrian and even pre-Cambrian time have had to undergo radical changes as the discoveries of new faunas have followed fast upon each other.

Genus, **Prodromites**, *gen. nov.*, Smith and Weller.

Type, *P.* (*Goniatites*) *gorbyi* Miller, 1891, Advance Sheets Seventeenth An. Rep. Geol. Survey of Indiana, p. 90, Plate XV, Fig. 1; and Seventeenth An. Rep. Geol. Survey of Indiana, 1892, p. 700, Plate XV, Fig. 1.

The type species was originally described as a goniatite, but a most liberal interpretation of that group could not include this form, which was assigned to that division simply because of its occurrence in Carboniferous rocks.

The genus *Prodromites*[1] is characterized by its laterally compressed, discordal, involute, deeply-embracing whorls, narrow umbilicus, high, hollow abdominal keel, and complex, ceratitic septa. Where the keel is broken off, as is usually the case, the abdomen is narrow, slightly flattened, and angular. The surface, so far as known, is smooth, and destitute of ribs, constrictions, or other ornamentation. The septation is the most distinctive feature of this genus, on account of the large number of serrated lobes, and an extensive auxiliary series of lobes and saddles. The ventral lobe is rather long and undivided, the saddles all rounded and entire, the first four or five lateral lobes are serrated, and in addition to these there is a series of several pointed and more or less irregular auxiliary lobes.

The only Paleozoic form to which *Prodromites* may be likened is *Beloceras*, which it resembles only in its compressed involute form and the multiplication of the elements of the septa. The resemblance is not great, but the agreement is fundamental, and these two genera may safely be placed in the same family or phylum. A much greater resemblance and probably kinship connects this form with *Hedenstroemia* Waagen, of the Lower Trias of the oriental region. The best known species of that genus is *H. mojsisovicsi* Diener, Pal. Indica, *Cephalopoda of the Lower Trias*, page 63, Plate XX,

[1] The etymology of the word is from the Greek of scout or forerunner.

Figs. 1 *a–c*. In *Hedenstroemia*, as defined by Waagen,[1] the ventral lobe is divided, the external saddle divided by adventitious lobes; the first four lateral lobes are serrated, and there is a series of about six pointed auxiliary lobes. The form is flattened, involute with narrow and angular abdomen. No keel is known, and the shell is smooth. In *Prodromites* the ventral lobe is undivided and the external saddle is entire and rounded; but in the serration of the first four or five lateral lobes and in the auxiliary series it is almost identical with *Hedenstroemia*, as also in the form, with the exception of the keel, which may not have been preserved on the few specimens known. There can be no doubt that these two genera belong to the same family, and even subfamily, in spite of the long time that intervened between the Kinderhook formation of the Lower Carboniferous and the Lower Trias. *Hedenstroemia*, according to Waagen,[1] belongs to the Pinacoceratidæ, subfamily Hedenstroeminæ, which also contains *Clypites* Waagen, and *Carnites* Mojsisovics, of the Lower Trias. The family Pinacoceratidæ in the broader sense, as defined by Waagen (*op cit.*, p. 139), contain all forms with compressed involute whorls, many lateral lobes and saddles, and an auxiliary series of lobes outside of the umbilicus. In this family belong the following subfamilies: (1) Medlicottinæ, (2) Beloceratinæ, (3) Beneckeinæ, (4) Hedenstroeminae; all of which have representatives in American Paleozoic or Triassic strata.

It is not likely that *Prodromites* is a descendant of *Beloceras*, since the septation is quite different in the two genera; and unless *Hedenstroemia* should be found to have a keel, it is not likely that it has descended from *Prodromites*. *Beloceras* is commonly placed under the Prolecanitidae, although it antedates any typical species of *Prolecanites*. On the other hand, *Medlicottia*, which is closely related to *Prodromites*, seems certainly to have been a descendant of the typical Prolecanitidæ. No solution of these questions is possible until the ontogeny of several of these genera is known, which is prevented at present by a scarcity of specimens. Until other evidence is forthcoming, *Prodromites* is placed in the family Pinacoceratidæ, subfamily Hedenstroeminæ.

This genus is not founded solely on Miller's figure, which is not accurate, nor even on his type specimen, but also on three other specimens of this species, and one of another species, bringing out certain characters that did not show on Miller's type.

The writers have had at their disposal for study four specimens of *Prodromites gorbyi* Miller, and one of *P. praematurus* S. and W., all of which, except one, belong to the paleontological collection of the Walker

[1] Pal. Indica. Salt Range Fossils. Fossils from the Ceratite Formation, p. 140.

[1] Pal. Indica. Salt Range Fossils, Vol. II. Fossils from the Ceratite Formation, p. 140.

Museum at the University of Chicago, to the authorities of which the writers' thanks are due for the use of the specimens. The first specimen,[1] No. 6208, is Miller's type of *Goniatites gorbyi*, and came from the Chouteau limestone at Pin Hook Bridge, Pettis county, Missouri. A second specimen, No. 6474, was secured from Professor G. C. Broadhead. It is better preserved than the type, but in the same sort of limestone, and while it is merely labeled "Chouteau limestone, Pettis county, Missouri," it probably came from the same locality as the type. A third specimen, No. 6222, is recorded merely from the Kinderhook beds of Burlington, Iowa. The material in which it is preserved is a buff or yellowish, rather finely crystalline limestone, the position of which in the Kinderhook section at Burlington is probably near the top, between the oolitic limestone and the buff magnesian bed, which lies immediately below the Burlington limestone of Osage age, or in the basal portion of the oolite bed. This horizon may then be correlated with the Chouteau limestone of central Missouri.

A fourth specimen of *P. gorbyi* was studied by the writers in the collection of Fred. Braun, of Brooklyn, N. Y. It came from the Kinderhook goniatite bed of Rockford, Indiana, associated with *Prolecanites lyoni* Meek and Worthen, *Aganides rotatorius* de Koninck, *Muensteroceras oweni* Hall, *M. parallelum* Hall, and thus is certainly in the zone of *Aganides rotatorius* of the Tournaisian horizon of the Lower Carboniferous.

A fifth specimen of the genus, No. 6223, belongs to a new species (*P. praematurus* Smith and Weller). It came from the Kinderhook goniatite beds of Rockford, Indiana.

Geologic horizon.—Since this genus occurs in the same horizon, in rocks of different lithologic character, and in three localities separated by hundreds of miles, it may be considered as characteristic of the Chouteau limestone horizon of the Lower Carboniferous, equivalent to the lower part of the Tournaisian horizon of the European Dinantian formation. At present *Prodromites* is unknown outside of America, and but two species are known, in the Mississippi valley region, from the three localities mentioned.

Prodromites gorbyi Miller. Plate VI, Figs. 1. Plate VII, Fig. 9. Plate VIII, Figs. 1, 2.

1891 *Goniatites gorbyi* Miller, Adv. Sheets, Seventeenth Rep. Geol. Survey of Indiana, p. 90. Plate XV, Fig. 1.

1892 *Goniatites gorbyi* Miller, Seventeenth Rep. Geol. Survey of Indiana, p. 700. Plate XV, Fig. 1.

Neither the description nor the figure given by Miller of this type is accurate, the drawings of the septa being entirely too generalized.

[1] The numbers refer to the Walker Museum collection.

The form is laterally compressed, involute, discoidal, with very narrow umbilicus. The abdomen is narrow, and surmounted by a high narrow hollow keel, which however is usually not preserved. Where the keel is broken away the abdomen is narrow, less than a millimeter wide, with angular edges.

The sides are smooth, devoid of constrictions, ribs, or other ornamentation, so far as could be determined from the casts.

The septa are complex, ceratitic, with many lobes and saddles. The ventral lobe is long and undivided. The external saddle is rounded and shorter than the laterals. The first lateral lobe is serrated, four-pointed; the second, four-pointed; the third, the three-pointed; the fourth, irregularly three-pointed; the fifth irregularly bifid. With the sixth lateral lobe begins the auxiliary series of goniatitic lobes, which are of irregular size, and eight in number, growing smaller towards the umbilicus. These characters could not be made out distinctly on Miller's type specimen No. 6208, but the details were clearly seen on specimen No. 6474, from the same locality. The differences between the two specimens, at a casual glance, might seem to be specific, but closer study shows them to be due to difference of preservation, and to different sizes at which the septa are seen. The type specimen shows the keel only at a few places on the periphery, and so indistinctly that Miller overlooked it, while No. 6474 shows the keel, 3½ millimeters high, entirely around the periphery. On both specimens the body chamber is incomplete and occupied a little over a quarter of the last revolution. It is not known what was the shape of the aperture, how long the body chamber was, when the keel began, nor what the internal lobes were like, since none of the specimens available sufficed to settle these questions.

A smaller specimen, No. 6222, from the Kinderhook beds of Burlington, Ia., showed much simpler septa, and the narrow angular abdomen with the keel broken off. It is undoubtedly in the beginning of the mature stage of growth, and was of value in showing the shape of the cross-section, since both sides were free from the matrix, while in all other specimens one side was fixed to the matrix.

At present there are known only four specimens of *Prodromites gorbyi*.

1. Miller's type, from the Chouteau limestone at Pin Hook Bridge, Pettis county, Missouri. No. 6208, Paleontological Collection, Walker Museum, University of Chicago. This is the type of the genus *Prodromites* Smith and Weller.

DIMENSIONS

Diameter	114[mm]
Height of last whorl	64
Height of last whorl from the preceding	35
Width of last whorl	..
Involution	29
Width of umbilicus	4

2. Specimen obtained from Professor G. C. Broadhead, Chouteau limestone, Pettis county, Missouri, probably from the same locality as the last. No. 6474, Paleontological Collection, Walker Museum, University of Chicago.

DIMENSIONS

Diameter	117[mm]
Height of last whorl	68
Height of last whorl from the preceding	38
Width of last whorl	..
Involution	30
Width of umbilicus	5?

3. Specimen from the Kinderhook limestone of Burlington, Ia., near the top of the Kinderhook Series as exposed at that locality. No. 6222, Paleontological Collection, Walker Museum, University of Chicago.

DIMENSIONS

Diameter	75[mm]
Height of last whorl	42
Height of last whorl from the preceding	25
Width of last whorl	10
Involution	17
Width of umbilicus about	4

4. Specimen from the Kinderhook goniatite limestone of Rockford, Ind.; in the paleontological collection of Fred. Braun, of Brooklyn, N. Y., where it was examined by the writers. Its dimensions are about the same as of the two specimens from Missouri.

Prodromites praematurus sp. nov., Smith and Weller. Plate VIII, Figs. 3, 4.

Type is specimen, No. 6223, Paleontological Collection, Walker Museum, University of Chicago. Form laterally compressed, discoidal, involute, deeply embracing, with narrow umbilicus, narrow slightly flattened abdomen surmounted by a hollow keel three millimeters high. Whorl indented by the preceding whorl to a little over one third of its height. Surface smooth, so far as known.

The septa are complex, ceratitic, with rounded entire saddles, serrated lateral lobes, and a series of auxiliaries above the umbilicus. The ventral lobe is narrow, and undivided; the first lateral is longer, and three pointed; the second lateral, four-pointed; the third lateral, bifid; the fourth lateral, bifid, but more deeply so than the third; then begins a series of auxiliary lobes, undivided and pointed, seven in number.

The only species with which *Prodromites praematurus* might be compared is *P. gorbyi*, from the same horizon; but in *P. praematurus* the abdomen is slightly broader, the shell rather thicker, the septa rather more complex, and the umbilicus slightly wider than on *P. gorbyi* at the same diameter. In the figures and the descriptions of the septa a difference between the two species may easily be seen.

DIMENSIONS

Diameter	$62^{m.m}$
Height of last whorl	34
Height of last whorl from the preceding	21
Width of last whorl	9.5
Involution	13
Width of umbilicus	6.5

This specimen was septate throughout, so the length of the body chamber could not be ascertained.

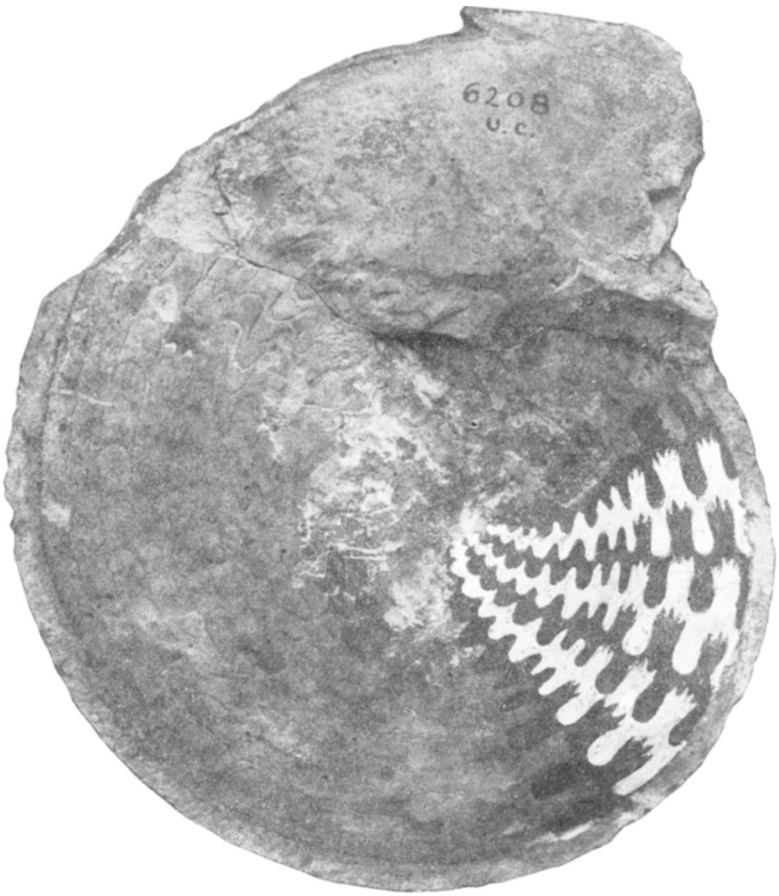
Only a single specimen is known, No. 6223, of the Paleontological Collection, University of Chicago, from the Kinderhook goniatite limestone of Rockford, Indiana.

CONCLUSION

In *Prodromites* we have the oldest known ammonite and the most complex ammonoid yet described from strata older than the Permian, occurring only a short distance above the base of the Lower Carboniferous. In all probability the ancestors of this genus had already become ammonites before the close of the Devonian, but we do not know where to look for them. The Kinderhook ammonoid fauna is exotic in America, and seems to be exotic wherever it is known. But in the faunal region from which this migration came we may expect to find a highly specialized fauna of which those forms that made their way into Europe and America in Tournaisian time are but a fragment. We have, as yet, no clue as to where this region was, but the vast unexplored Paleozoic stretches of Asia lead us to hope for much new information when that continent shall be thoroughly investigated.

The occurrence of such forms as *Prodromites*, without local ancestors serve only to emphasize our ignorance of the ancient zoology of regions outside our own, and should stimulate research in geographic distribution of fossil faunas.

JOUR. GEOL., Vol. IX, No. 3 Plate VI



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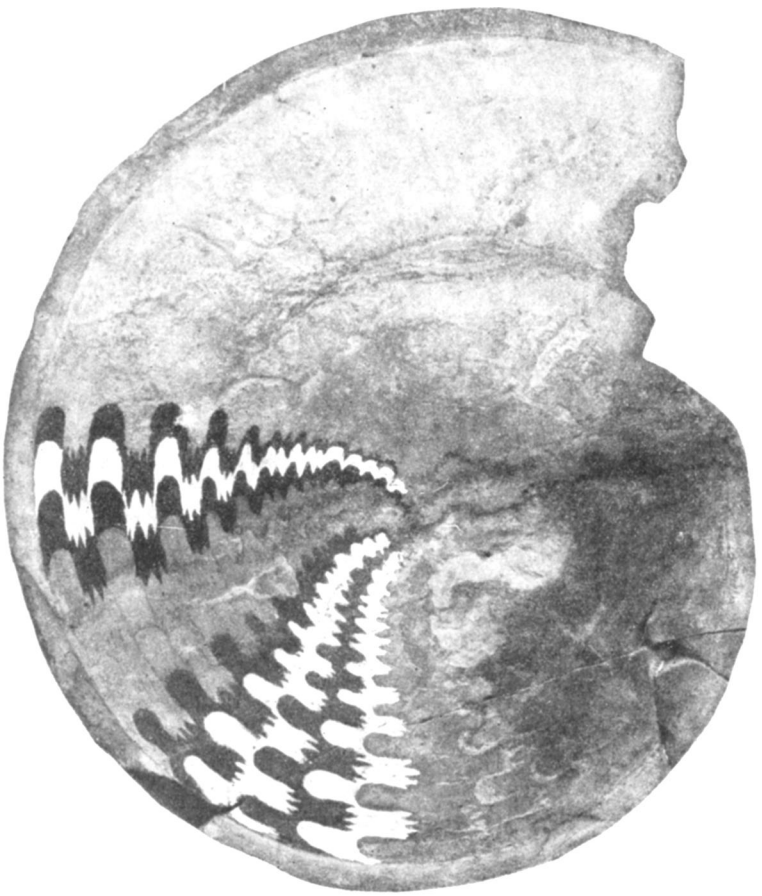

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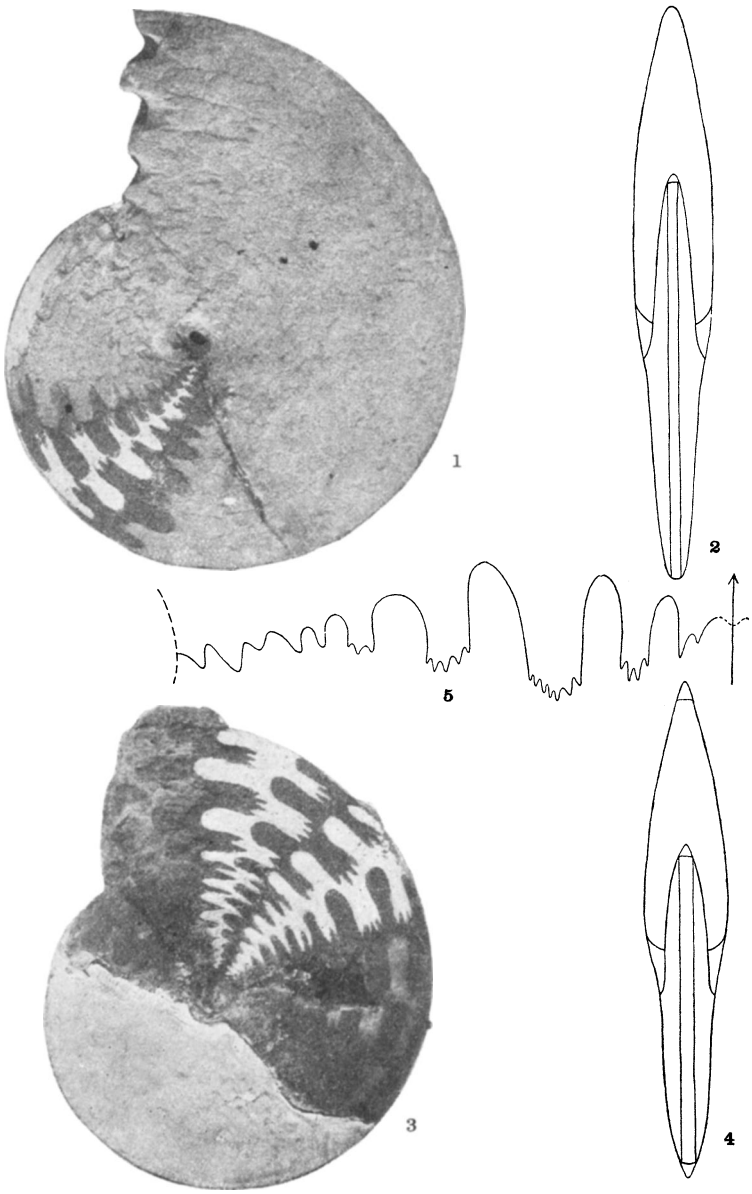
JOUR. GEOL., Vol. IX, No. 3 Plate VIII



EXPLANATION OF PLATES

(All figures are natural size)

PLATE VI

FIG. 1. *Prodromites gorbyi* (Miller). No. 6208 Pal. Coll. Walker Museum. Miller's type specimen from the Chouteau Limestone, Pin Hook Bridge, Pettis county, Missouri.

PLATE VII

FIG. 1. *Prodromites gorbyi* (Miller). No. 6474 Pal. Coll. Walker Museum. From the Chouteau Limestone, Pettis county, Missouri.

PLATE VIII

FIG. 1. *Prodromites gorbyi* (Miller). No. 6222 Pal. Coll. Walker Museum. From the Kinderhook beds, Burlington, Iowa.

FIG. 2. Front view of the same.

FIG. 3. *Prodromites praematurus* sp. nov. Smith and Weller. No. 6223 Pal. Coll. Walker Museum. From the Kinderhook Goniatite bed, Rockford, Indiana.

FIG. 4. Front view of the same.

FIG. 5. Septa of *Hedenstroemia mojsisovicsi* Diener. After C. Diener, Pal. Indica, series 25, Vol. II, Part II, Plate XX, Fig. 1*c*.

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